

FIRST ANNUAL REPORT
OF THE 3
Trustees of the Water Works,

FOR THE YEAR ENDING MARCH 31, 1871.

TOGETHER WITH THE
Reports of the Chief Engineer and Secretary.

ALSO THE
BY-LAWS AND REGULATIONS

AND
TARIFF OF WATER RATES

ADOPTED BY THE BOARD OF TRUSTEES.

COLUMBUS, O:
NEVINS & MYERS, BOOK AND JOB PRINTERS.
1871.



Officers of the Water Works.

BOARD OF TRUSTEES,
WILLIAM MONYPENY,
RICHARD NEVINS,
CHARLES AMBOS.

CHIEF ENGINEER,
J. L. PILLSBURY.

SECRETARY,
J. R. ARMSTRONG.

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ANNUAL REPORT OF THE TRUSTEES.

COLUMBUS, O., April 1, 1871.

To the Hon. City Council of Columbus, O.:

GENTLEMEN :—The undersigned Trustees of Water Works herewith submit their first annual report of the condition and transactions of the Water Works for the year ending March 31, 1871.

The Trustees in accepting the arduous and thankless office which they hold, have been guided by the rigid principle of making no important contract, or rule of action unless the full board were present and unanimous, and they offer to their constituents the results of their efforts, as detailed in the very able and descriptive reports of the Chief Engineer and Secretary.

The reports of the Secretary will show in detail the expenditures in each branch of construction, and the Trustees feel certain that the system of book keeping has been as descriptive and explanatory as it is possible for such a record to be, and that it exhibits in a most lucid and satisfactory manner, a true statement of the way in which the Water Works fund has been expended.

We ask the attention of the Council to that portion of the Engineer's report in which he states the need of \$250,000 to complete the work, and merely stating here that every person who had fairly considered the matter has known from the first that this amount would doubtless be required. We wish to say that it is of vital importance that the Trustees have the requisite means to finish the work and make a wide distribution as soon as possible.

The reasons are briefly enumerated :

1st. That the whole city may realize the benefit of fire protection.

2d. That every citizen who desires it may have water supply.

3d. And last, but not least, that the city may realize the full income from the work as early as possible.

The report under consideration shows a small pipe may bring in more income than the larger ones and frequently does do so, and it is certain in our case that our largest rents will be paid on pipes of 6 inches or less diameter. And while this reason exists in full force—we are all aware that the season for doing such work advantageously is now at hand—and it is of great importance that our engine house be built as soon as possible, that the wall may be thoroughly seasoned before frosty weather returns.

To the foregoing reasons why the work should be pushed without delay is the fact that such a large number of our citizens are depending upon the extension of pipes for water. Calls are made almost hourly at the 'Trustees' office, asking for extensions to be made in almost every direction; and these people are depending upon the water, either as relief from present or anticipated water famine.

The demand for water in this city is unprecedented, and the Trustees have every reason to believe that the income of the works will be remunerative. The rates established are, by most people, considered reasonable and just. They have been guided in adopting both rules and rates for sale of water by the peculiar condition of water supply in Columbus, and have availed themselves of the experience of other places, so far as applicable to this case; and they feel justified in believing that this tariff of rates will produce the

required income for paying running expenses and the interest on the debt. The sooner the work is completed, the sooner this financial result will be attained.

We wish the citizens generally to note the suggestions of the Chief Engineer, that proper tests and investigations be made to prove that a softening process of the water now supplied is *possible*. While we are not prepared to express an opinion for or against the process, we are of the opinion that the tests should be made, and if the process can be made an unqualified success, it would justify a reasonable expenditure for that purpose; and would, without doubt, largely increase the number of customers, and, as a natural result, the income of the works.

WM. MONYPENY,
RICHARD NEVINS,
CHARLES AMBOS,

Trustees.

ANNUAL REPORT OF THE CHIEF ENGINEER.

COLUMBUS, OHIO, March 31, 1871.

To the Trustees of the Columbus Water Works :

GENTLEMEN :—On the 23d day of May, 1870, I commenced, under your directions, preparing specifications for pipe laying, pipe making, trenching, building stone and other required materials for beginning the construction of water works for your city. Advertisements were published, and measures taken for a vigorous prosecution of the work, and in due time contracts were made for all the leading parts of the work.

I may say, in passing, that on March 6th, 1871, abundant streams of water were thrown through hose in the State House yard, and our citizens had the pleasure of knowing that but 9 months had passed since the first work was done, and that the success of the works were established beyond a question.

The location in which the engine house was to be placed being very low and the base uncertain, it was thought best that all work pertaining to foundations and filtering gallery or supply well, should be done by day work under the engineer's personal superintendence, and when closer examinations were made, the wisdom of this course was proved—as it was found necessary to erect a chimney base, 22 feet high, in order to reach from the safe gravel deposit to a point fairly above ordinary high water. The masonry pier on which the engines and pumps stand, is of the same total height ; besides a subway 14 feet deeper, in the gravel to conduct water to the pumps. This pier is 30 feet wide, 41 feet long, with 16 counterforts projecting 7 feet from the east half of

it, which carry 8 steps descending to the level on which the engines and pumps are placed. The foundation walls of the building do not reach the gravel, but rest on a firm earth base, in a trench 6 feet wide, with level bottom in which 18 inches of concrete, made on the Coignet principle, has been rammed. This mixture, made with a small amount of water, and beaten with very heavy rammers in thin layers, sets into a very strong stone, and is better for a footing course than any amount of large blocks. Upon this "Beton Coignet," is an 18 inch layer of Lancaster sandstone, narrowing 6 inches on a side, the stones being laid as headers as much as possible, the joint pointed with cement-mortar and then all vacant places in the interior being filled with broken stones, a coarse strong cement grout was poured, filling all interstices. In this manner the entire wall and piers have been built, and they are practically one block of stone, and they are beyond question as solid and durable pieces of masonry as can be found, or built. The building walls are only 14 feet high. But even with this depth it required an enormous amount of stone and cement as well as labor to build them. Every course being rigidly tested by the engineer and no slighting was permitted. The stone of machinery pier and foundation walls, were furnished by Messrs. Sharpe and Carlisle, of their Lancaster sandstone. The stone for chimney base is limestone furnished by Mr. Price, of your city. The steps, pillars and ornamental flagging, are of the blue Delaware limestone, and the heavy bed stones on which the pumps and engines are placed, are from the Dayton quarries. The cement used has been principally from the mills of H. R. Beeson, Uniontown, Pennsylvania, and has the merits of quick setting and great strength.

Safety from river inundations was secured by constructing

a levee from the Dublin bridge, to a point below the building, when we could unite the new work to an older and inner levee. The materials for this were principally taken from the bed of the river alongside of the levee; but a small part of it was supplied from an island below, which was used partly in the levee, and partly for filling about the engine house. At the same time, we were trying the experiment of a well for supplying water, a brick curb of 20 feet inside diameter, was sunk 22 feet below the surface of the river, and when it had been sunk as far as the Engineer deemed useful, plans were made for trenching to the river, and to the centre of the engine piers.

Any system of tunnelling would be useless for our purpose, if not actually dangerous to the workmen, as the gravel once started would run faster than men could escape, and we were compelled to cut our open trench, build our brick sub-way, and refill the cut. To do this in an irregular gravel bed having seams of clay and pockets of quicksand, the trench being 18 feet below the river, was no easy matter, and involved great expense. The machinery required was two twenty-horse power portable engines, three of Heald and Sisco's rotary pumps, one hoisting engine, one boom derrick with dump boxes, hoisting tackle, sheeting plank, timbers, bricks, tiles, etc., etc. When the water was down, it was well within the power of the engines and pumps to keep it down, but one half hour's stoppage of a pump drove out the workmen, and washed yards of gravel and sand into cleared spaces, causing great delay and damage, and the utmost vigilance was required to prevent them. For thirteen weeks, night and day, one engine and pump were in incessant motion; the other engine fired up within five minutes of being ready to work, and many times this arrangement was

all that saved us from a damaging overflow. Regular relays of engineers, firemen and laborers were employed in twelve-hour shifts; and as fast as the trench was cut to the proper depth, nine-inch tile were laid in the angles to carry off the water, and a brick sub-way five feet vertical, by four feet horizontal, was built in cement mortar. A brick was left out about every lineal foot of trench, to admit water by percolation; and the last day's pumping showed by guaging nearly 2,000,000 gallons supply. One end of this sub-way terminates in the deepest water of the river, and a tower rising above the usual level contains a twelve-inch gate through which water can be admitted to the sub-way, if required in any emergency. This tower is constructed with a tile opening (now closed with brick), from which a tile filter can be extended up and down stream any required distance, and by this means a great addition to the present supply can be secured at a cheap rate. The other part of the sub-way runs from the main well until it comes opposite the pier of the engine house. At this point, a brick conduit, three feet in diameter runs into the base of the pier and ends in two wells, six feet in diameter, which receive the suction pipes of the rotary pumps, while a side channel in the pier supplies the gang suction. The entire length of the sub-way is two hundred and fifty-six feet, including the well and piers.

The central well is arched over with a brick top sixteen inches thick, with a central cast iron cap fitted with air tight joint.

It is evident from our guagings of the filtering gallery that it will not give a sufficient supply for the future, while it is ample for present use; and in order to avoid, if possible, any further extension of so expensive a feature of our works, I have designed a plan which will bring atmospheric pressure

to aid in forcing an unusual supply into the sub-way already built. To accomplish this, the tower in the river and the central well have been made air tight, and the suction pipes of the rotary and gangway pumps pass through heavy cast iron plates with a tight joint, and all escape, or other pipes, going to the sub-way are made air tight. As the top of the sub-way is twelve feet lower than low water in the river, and the suction pipes pass to the very bottom of the wells, any approach toward a vacuum, caused by the action of the pumps, will be restored to equilibrium by atmospheric pressure upon the points of least resistance; and as our levee and embankment of twelve feet depth over the line of the sub-way makes the points of least resistance from fifty to one hundred feet away from the line, it is reasonable to suppose that a large area of water will be pressed in the gravel towards the sub-way, thus keeping it full, instead of depressing it directly over the conduit, and allowing air to pass into the sub-way. This can never happen, in my opinion, however great the draught of the pump may be. A suction approaching vacuum to the amount of one pound per square inch would be equal to a rise of water in the gravel of 2.31 feet; three pounds nearly equal to seven feet rise. The experience of drove tube wells, of oil and salt wells, with their packing of seed bags, and an experiment of my own of cementing the walls of a nearly dry well and arching it over with a tight covering, allowing no air to pass to the water surface except from outside the well and through the soil, proves to me that this experiment will be of the greatest benefit to our water supply, and may save many thousands of dollars which an equivalent extension would cost.

A consultation of the Trustees, Chief Engineer and Architect resulted in a unanimous opinion that a building of so

much importance as our engine house should not be erected on new foundations, especially as ten to twelve feet of embankment was required about the entire building, and the plans for foundation walls had been made with this embankment as an important condition of their stability. Accordingly it was agreed that the contract for the building with Mr. P. A. Schlapp should be extended, and construction delayed until a proper time in the coming spring. Temporary sheds for engines and boilers were erected, and the completion of the chimney pushed forward so that no delay in the water supply should occur.

The finishing of the engine pier, including some ornamental work in Delaware stone, was kept up until cold weather prevented work. The reason why Delaware stone is used is this: after a careful examination of the Columbus stone in steps, post and ashlar work, I found, as steps, it wore rapidly away; posts were liable to crack and laminate on the upper end; and ashlar work, flagging, and all varieties of work seemed to disintegrate and lose the tool-marks very soon, and signs of weathering are on nearly all the stone of this kind. Besides, the stone is not of an elegant appearance as to grain or shade. The Delaware stone examined and tested by the same rules, shows a much finer color and grain, is durable when exposed to atmospheric influence, and will stand much greater wear as steps or flags, without losing the tool-marks; and this stone is used for the steps, ornamental flags, posts and coping of the engine pier.

The contract for furnishing iron pipe was given to Long, Smith & Co., who were to make all the pipes in the city of Columbus, erecting works for that purpose, and the pipes were to be made after, and in accordance with a specification

drawn up by the Chief Engineer, in which the quality and character of iron and the manner of making and testing the pipes, was minutely specified, and which specification was made a part of the contract. The Engineer has always had a special inspector at the works, who assists in and directs the water test, with positive instructions to condemn and reject any pipe not standing the full 300 pounds pressure per square inch. The actual trials of pressure upon the pipe already laid, have shown the very unusual case of over six miles of pipe pressed to 175 pounds per square inch, and no pipe failed. One cross (not made in Columbus) failed, and one pipe-bowl sprung a leak under the test, which were the only unfavorable results. The entire pipe system has repeatedly been pressed as hard since, and no more breaks have occurred. If the remaining pipes are as carefully made, there is no fear of rupture in the system, under any of the fire pressures that may be used hereafter. I must here say that to this careful and rigid inspection of our pipe at the works, in part, but more especially to the careful and honest mixing of the specified irons in the cupola, and the proper weight of pipe, we are indebted for our successful results in the final test of the pipes when laid. And I suggest that the Chief Engineer be fully sustained by the Board in insisting upon a faithful compliance with the printed specifications under which the contract was made, and which is a part of that contract.

Owing to the seeming necessity for beginning pipe-laying last fall, it was deemed advisable to bring the twenty-inch pipes from the foundry of Dennis Long & Co., of Louisville, Ky., and accordingly it was so done, and the pipe laid as far as Pearl street. A few hundred feet of eight and twelve-inch pipe was also brought from Silas Merchant's

works in Cleveland, but the stock from both places was made after our specifications, and are of the same character of pipe, and it is believed may be equally depended on. The pipe being, in our case, the one great expense of our work and the cost of replacing bursted or damaged pipe, being so enormous, too much care can not be taken in securing perfect work in the first place. The difference in cost between a poor and a good set of pipes and branches can easily be expended in repairs of the poor line, besides the intense annoyance and trouble which is caused by flooding cellars and breaking up the streets for repairs. This condition of things, we may safely assume, will not exist in Columbus. The pipe-laying, by Fred. Collins, has been done in first-class style, and the Chief Engineer has always found him ready and willing to follow instructions, and has never had to complain of unfaithful work.

THE AMOUNT OF PIPES LAID, UP TO MARCH 31.

20 in. pipe on Spring street.....	4,912 feet.
12 " " "	1,417 "
8 " " "	16,627 "
6 " " "	1,015 "
4 " " "	8,828 "
Total.....	32,799 "

Or $6 \frac{119}{5280}$ miles.

And the pipe works have made for us—

1,071 4 inch pipe. Wt. 160.65 tons. Lt. 12,852 feet.	
1,047 6 " " 235,58 " " 12,564 "	
1,872 8 " " 561,60 " " 22,464 " 9.07 ms.	
Total.....	957,83 " " 47,880

And run out daily from 20 to 30 tons ready for the Pipe Layers, besides keeping us supplied with special castings of

an improved pattern. They are now beginning to turn out 12 inch pipe, of which about 1 mile is required. To complete the works, giving a full supply of hydrants and stop-valves, and extend the pipes so that all principal parts of the city are within the working distance of a hydrant, will probably require an additional expenditure of \$250,000, and it would seem a proper course if a sum of not less than that was provided for that purpose, bearing in mind that in the latter part of a water works extension a 4 inch pipe may supply as many customers and as much income as a 20 inch pipe in the beginning. It is always a mistaken policy which suspends a work when the expensive main pipes are laid, as the smaller ones generally give an equal if not an increased number of customers. In our case, the 4,912 feet of 20 inch pipe cost about the same as 41,260 feet or nearly 7.8 miles of 4 in. pipe. The principle of distribution is to run main lines of large pipe at right angles north and south from the 20 inch main on Spring street, following the alleys when possible, and to cross these with reinforce lines on Broad and Rich streets, and to gather the ends of the mains into a large pipe on South Public lane, which again gives off a set of mains of smaller size to continue south and by the proper distribution of stop-valves, a small section of 2 or more blocks can be cut out of the system for repairs, or otherwise, and a full collateral circulation will be maintained all around the closed district. This avoids the waste of much water when drainage of pipes must be done, and as it costs money to put the water in the pipes, it is well to waste as little as possible. We are seldom likely to put too many stop-valves or fire hydrants in a pipe system.

The system now has one 20 inch valve, two 12 inch valves, twenty-two 8 inch valves, six 6 inch valves, forty-five 4 inch

valves, of which last number, 30 are placed as watch gates in front of as many Holly Hydrants which are placed at street crossings, the intention being that one double-headed hydrant, shall be at each street intersection, where the city is in regular squares, and where they must be set without reference to cross streets, one on every 400 feet as nearly as may be convenient.

A vacant lot on Pearl street, back of 1st National Bank, has been obtained and is used as a pipe yard, in which valves, hydrants, special castings, lead, water pipes and all the fixtures for conducting the work are kept in store, and a building for a fitting room and the necessary tools for fitting service pipes are provided and ready for service.

The service pipes already laid have been of wrought iron pipe coated with a varnish, which insures durability and is much cheaper than lead pipe services.

Our trenching contract with McCabe and Murphy has been rushed as rapidly as we could desire.

The Holly pumping machinery, now set up and working daily, is proving itself equal to the fulfillment of the contract stipulations. I should suggest some alterations in the detail when the building is finished, preferring a differently constructed blower, to be run by a steam cylinder or rotary; and it is probable a change in the boiler system will be beneficial. The present arrangements will answer until such matters can be accurately determined, and there is no doubt but the pumping machinery will sustain the high reputation the Holly system deservedly holds. I would suggest that we begin regular pumping service on the first day of May, and that due notice be given through the city dailies, that consumers may have their rent paid and water turned on, and be ready to receive the full benefit of the water.

The work on building has been commenced, and a vig-

orous prosecution of it is ensured; and the architect, Maj. Kelly, will spare no pains or watchfulness that every part is of first-class workmanship and material. As soon as the roof is on, the shed, covering and encumbering the engines and boilers, will be torn down, and a temporary coal house built from the materials, situated between the levee and building. This temporary shed will answer until the embankment has settled so as to permit a safe foundation to be laid, when a suitable and tasteful building should be erected for a permanent structure.

A dwelling house or two, or one building with two tenements, for the use of engineers and firemen, should be erected on the ground between the building and Dublin bridge, as it is absolutely requisite that the force required to work the machinery live near the works. The space between levees above the works should be filled as soon as possible, and the bank east of the building should also be widened without delay, even if the entire filling should be delayed for years. The open space east may be of great value to the works for special purposes, to be mentioned hereafter.

Forty-two permits for taking water were issued by the Secretary previous to April 1st, and a very large number are anxiously awaiting the arrival of a water-pipe in their street or alley. The State House, county buildings, Odd Fellows' Temple, (which had the honor of being No. 1) several breweries, tanneries, and large manufacturing establishments, are in this number; and the anxious inquiries of citizens in the water works office shows plainly that the demand for water will be extremely large. And yet, many people who would otherwise equally desire it, are deterred because, although it is much softer than the well water in the city, it is not real soft water. Give them soft water, and

the demand would be almost unanimous, and the income immensely increased. We can not estimate the increase, but the people all feel this statement to be a fact.

Now, I believe it is possible to give Columbus an abundant supply of positively soft water, fitted for all laundry, toilet, culinary or drinking purposes. The water as it is now supplied, contains carbonate (probably a bi-carbonate) and sulphate of lime, principally, possibly a trifle of magnesia and other salts, but lime, insoluble carbonate, is the chief difficulty. A process has been practiced, and is now employed in some places, by which a solution of caustic lime is injected into the pumps in proper equivalents, and being thus intimately mixed with the hard water, absorbs carbonic acid from the already existing carbonate of lime, becomes an insoluble precipitate of lime itself, and falls to the bottom, leaving the water soft and free. If too little of the lime solution is used, it does not entirely soften the water, as it can only neutralize its chemical equivalent of the salts, and it is better to leave it with a very slight amount of hardness, as it can be made soft enough for all practical uses. An over-dose of the caustic lime solution makes the water perhaps worse than it was before.

I have consulted Prof. Wormley as to his views of the suitability of the process for the water of this section, and he says it can unquestionably be carried out here, after making the proper series of tests of the water in different stages of the river; and also states that any man of ordinary intelligence can make the tests of the water which would be required from time to time to ascertain what the proper equivalent of caustic lime solution should be. After the mixing of the solution and water, it should be allowed a few hours to deposit the insoluble lime precipitate, and may then be sent through the pipes, a beautifully clear, soft water: otherwise,

if not allowed a period for settlement, the pipes would be loaded with a deposit, and the culinary utensils and drinking glasses would show a film of white powder, while the water itself would be turbid and milky in appearance.

- This process would involve pumping the water from the supply well, into settling reservoirs, (which could be built between the inner and outer levees at a moderate cost), during which transit, the "milk of lime," or caustic solution, would be injected by a pump throwing true proportions into the pump barrels, so as to ensure perfect and intimate mixture, and then after a suitable time for deposit, it could be drawn through a flexible tube from the surface of the reservoirs by the pumps supplying the city.

In this way you can have as good soft potable water as is enjoyed by any city in the Union, at a trifling cost for additional labor, and a very moderate outlay for reservoirs, extra pumps and pipe connections, between the present pumping works and the reservoirs. No new buildings would be required and but little machinery, and that could be placed in the present building without crowding or difficulty. The reservoir site is already excavated, and the sum required to fill it level with the other grounds would go a long way towards building the necessary reservoirs for this work.

I think the Trustees and the people should take this matter into consideration, and the proper tests of the water in the different stages of the river should be made during the present season, in order to determine how uniform the hardness may be and what amount of solution is required to produce the desired softness.

Estimates of the cost of the required machinery and reservoirs, can be furnished when desired.

It is certain that a soft water supply would insure nearly

the whole population as customers, and would very largely increase the receipts of the works.

I would respectfully suggest that a set of observations be made, directed by a competent chemical authority, to ascertain all the necessary facts bearing upon the subject; and experiments and tests be ordered that shall develop this matter, and if feasible, chemically, I can answer that the cost of the machinery will be but a trifling percentage upon the cost of the entire works.

In conclusion, I have to thank the Board, personally, for uniform kindness and confidence, and for having sustained me in a most liberal manner; and my fellow laborer, Secretary J. R. Armstrong, for having supplied my lack of local knowledge, which, as a stranger among you, I felt. To his labors and investigation, the excellent set of regulations adopted by your Board are chiefly due, and the book keeping system devised by him for keeping the water works account, both expense and income, is the best and simplest I ever saw.

Superintendent of construction, George W. Platt, was during the time he was engaged on construction, a most valuable assistant, and I take pleasure in tendering to him and all the assistants, inspectors and foremen upon the works, my thanks for faithful and intelligent assistance in executing my plans.

Trusting we may succeed in bringing the construction account to a satisfactory close, within reasonable time, I am,

Very respectfully,

J. L. PILLSBURY,
Chief Engineer Columbus Water Works.

ANNUAL REPORT OF THE SECRETARY.

OFFICE OF THE WATER WORKS,
COLUMBUS, O., April 1, 1871.

To the Board of Trustees of the Water Works :

GENTLEMEN—I have the honor to submit herewith the Annual Report of Receipts and Disbursements of the Water Works for the year ending March 31, 1870.

The receipts for the year have been \$196,412.45. Disbursements, \$189,665.10. Balance on hand March 31, 1871, \$6,747.35.

Permit me, gentlemen, to return my grateful acknowledgments for the kindness and assistance received at your hands during my connection with your Board; and also to the Chief Engineer, J. L. Pillsbury, Esq., and other officers, for their aid in the discharge of my official duties.

The following statement of Receipts and Disbursements is respectfully submitted.

Very respectfully,

J. R. ARMSTRONG,

Secretary.

ABSTRACT OF DISBURSEMENTS FOR THE YEAR COMMENCING IN APRIL, 1870, AND ENDING MARCH 31, 1871.

Disbursements in	Engines, pumps, boilers, etc.	Building.	Pipe and special castings.	Stationery, books, etc.	Salaries of officers.	Lead, hemp, pipe laying and trenching.	Tools, and repairs of same.	Advertising.	Fire hydrants.	Valves.	Filtering galleries, levees, and foundations for building, machinery, etc.	Miscellaneous expenses.	Totals for each month.
April, 1870													
May.....													
June				\$112 65	\$924 62			\$117 75			\$2,071 29	\$792 36	\$4,318 67
July		\$155 00		117 55	758 81			33 00			6,807 21	499 66	8,371 23
August					633 33			112 37			13,343 58	581 39	14,670 67
September		300 00	\$10,000 00		583 33	\$3,806 55	\$15 35	27 00			12,724 34	57 39	27,343 96
October		2,963 00	14,194 73		583 33	1,523 36				\$1,634 38	8,614 25	354 66	29,927 71
November		3,500 00	5,000 00		637 43	1,073 75				57 36	7,912 59	136 51	18,617 64
December		1,007 82	3,500 00	19 06	633 33	363 83		5 30		40 86	3,118 74	153 13	8,842 07
January, 1871.....	\$10 75	431 03	20,307 45		608 33	504 04				300 54	1,441 27	201 42	23,804 80
February.....		423 14	10,717 15		633 33	1,500 86		70 00	\$500 00		905 65	159 33	17,268 46
March.....	114 75	66 24	28,032 50	112 05	527 13	1,534 17		10 00		79 24	5,805 72	217 19	36,499 89
Totals for the year.....	\$125 50	\$9,146 23	\$91,751 83	\$362 21	\$6,522 97	\$10,306 56	\$15 35	\$125 42	\$500 00	\$1,531 35	\$12,544 64	\$3,153 04	\$189,665 10

ANNUAL REPORT OF THE SECRETARY.

RECEIPTS.

The receipts for the past year have been as follows: In

April, 1870.....	
May.....	
June, from the city on construction account.....	\$5,000 00
July, " " ".....	15,000 00
August, " " ".....	23,200 00
September, " " ".....	15,000 00
October, " " ".....	32,000 00
November, " " ".....	15,000 00
" " old materials, etc., sold.....	7 90
December, " " ".....	3 70
" " from the city on construction account.....	10,000 00
January, 1871, " " ".....	25,000 00
February, " " ".....	15,000 00
March, " " ".....	41,000 00
" " from permits to connect with water pipes.....	200 85

Total receipts for the year..... \$196,412 45

Balance on hand March 31, 1871..... \$6,747 35

DISBURSEMENTS.

The disbursements for the past year have been as follows:

April, 1870.....	
May.....	
June.....	\$4,318 67
July.....	8,371 23
August.....	14,670 67
September.....	27,343 96
October.....	29,927 71
November.....	18,617 64
December.....	8,842 07
January, 1871.....	23,804 80
February.....	17,268 46
March.....	36,499 89

Total disbursements*..... \$189,665 10

Balance on hand March 31, 1871..... 6,747 35

Total..... \$196,412 45

* Deducting from the total of disbursements \$11.60, received for old materials sold, will leave \$189,653.50, which is the cost of construction to March 31, 1871.

BY-LAWS AND REGULATIONS

FOR THE GOVERNMENT AND PROTECTION OF THE COLUMBUS
WATER WORKS.

SECTION 1. The Trustees shall manage, conduct and control the works, furnish supplies of water, collect water rents, and appoint all necessary officers and agents, and determine the term of office and the amount of the salaries of the officers and agents so appointed.—*Municipal Code, Chap. XXV, Sec. 336.*

SEC. 2. Said Trustees shall be authorized to make such by-laws and regulations as they may deem necessary for the safe, economical and efficient management and protection of the water works, and such by-laws and regulations shall have the same validity as ordinances, when not repugnant thereto, or to the constitution and laws of the State.—*Same, sec. 337.*

SEC. 3. For the purpose of paying the expenses of conducting and managing water works, the Trustees of Water Works shall have power to assess and collect, from time to time, a water rent of sufficient amount, in such manner as they may deem most equitable, upon all tenements and premises supplied with water.—*Same, sec. 338.*

SEC. 4. No person, except the Engineer or Superintendent shall take water from any public or private hydrant, plug, street washer, draw-cock, hose-pipe or fountain, (except for fire purposes, or for the use of the fire department in case of fire); nor shall, in any way, use or take any water for private use, which is furnished by the water works, unless such person shall first pay for the same and receive the usual permit from the Secretary of the Water Works so to do.

SEC. 5. No person shall open any fire-hydrant or remove or obstruct the stop-cock cover of any fire-hydrant, private stop-cock of any street washer, place or deposit any dirt or other material in such stop-cock boxes, or turn any public or private stop-cock, or commit any act tending to obstruct the use thereof, or injure in any manner any building, machinery, pipe, apparatus, tools or fixtures of the water works.

SEC. 6. No person shall put any filth, animal or vegetable matter, chips, shavings or any other substance on the water works grounds, or do any injury thereto.

SEC. 7. No person shall deposit or throw any filth, dead animals or carcasses into the Scioto or Olentangy rivers, for a distance of five miles beyond and outside the corporate limits of the city, and at no place within such limits.

SEC. 8. Any person violating either of the provisions aforesaid, shall upon conviction thereof, be fined in any sum not less than five, nor more than one hundred dollars, or be imprisoned not less than ten nor more than thirty days, or to both such punishments, at the discretion of the court, and be liable to all damage and costs accruing from such violation and prosecution.

SEC. 9. No person but the properly authorized agents of the Trustees of the Water Works, acting under the direction of the Engineer or Superintendent, will be permitted to tap or make any connection with the main or distributing pipes of the water works.

SEC. 10. All tapping and making connections with street mains, and laying the necessary street service pipes and cocks will be done by a person duly appointed by the Trustees to do such work; who shall report truly to the Trustees the exact location, the numbers and sizes of all taps inserted by him, and the length of street service pipe laid; and such per-

son will make no connections until a permit stating size of tap and pipes and location of the same, is furnished him, by the party ordering the same.

SEC. 11. Applications for Permits to connect service or supply-pipe with the distributing pipes must be made to the Secretary, and the sum of five dollars paid in advance for inserting the service pipe and conveying the same to the line of the curb stone; and the permit shall be the Plumber's or Pipe Fitter's authority for connecting house-pipes with the street service, laying pipes and doing all plumbing work for which the permit was granted, subject to the By-Laws and Regulations applying to the same.

SEC. 12. Persons occupying adjoining lots may join in obtaining permits, if in the opinion of the Superintendent it may be done without detriment to the works; in which case a single service-pipe may be laid to the curb-stone and divided, giving each person an independent service; and the cost of such permits shall be \$3.50 for each, until otherwise provided.

SEC. 13. Service pipe intended to supply two or more distinct premises or tenements, must be provided with separate and distinct stop-cocks for each tenement on the outside of the same, or where only one stop-cock is used, the person or persons controlling the same, must pay the water rent of all parties who are thus supplied, as separate water bills will not be made.

SEC. 14. Persons taking water must keep their service pipe and all fixtures connected therewith, in good repair, and protected from frost, at their own expense, and must prevent all unnecessary waste of water.

SEC. 15. No addition, to or alteration whatever, of any tap, pipe, water-cock, or other fixtures, shall be made, or caused

to be made, by any person taking water, except by permission first obtained in writing from the Secretary.

SEC. 16. Hydrants, taps, hose, water closets, urinals, baths, or other fixtures will not be permitted to be kept running, when not in actual use.

SEC. 17. Applicants for water must state fully all purposes for which they require it, and must answer fairly and without concealment the necessary questions relating to the number of rooms cisterns, accessibility of neighbors and all possible chances of illegal use of water. Out door hydrants will not be permitted if water is allowed to be used by parties outside of the family.

SEC. 18. Yard fountains shall not be used more than six hours per day, unless specially permitted, and on additional payment; and the right is reserved to suspend their use whenever the public exigency may require. The rate for the season for fountains will be established according to the size of the orifice in a thin metal plate fixed in the supply pipe of the fountain, at its junction with the main or principal pipe from which it is supplied.

SEC. 19. Sprinkling streets and lots with hose is restricted to four hours per day.

SEC. 20. In sprinkling streets, each water taker must confine himself to the front of his premises, and half of the width of the street in front thereof.

SEC. 21. Hose larger than $\frac{3}{4}$ inch will not be permitted, except upon an additional charge, and sprinkling without nozzle or a larger opening than $\frac{1}{4}$ inch is forbidden.

SEC. 22. If a street washer, sprinkler, or hose is found out of order, leaking or used for any other purpose than for which it was intended, the supply will be cut off without previous notice.

SEC. 23. No lease of water will be made for a shorter period than for one year.

SEC. 24. All water rents are due and *payable semi-annually in advance*, on the first days of May and November, at the office of the Trustees of the Water Works. Ten per cent. penalty will be added if not paid within ten days.

SEC. 25. If any party shall refuse or neglect to pay the water rent when due, or permit any waste or use of water not authorized by the Rules and Regulations of the Board of Trustees, the water shall be turned off and not turned on again, until all back rent and damages shall be paid, and the further sum of *one dollar* for turning off and on the water.

SEC. 26. In case where water has been turned off for non-payment of water rent, or for any other cause, or when in the opinion of the Superintendent, turning off the water on the stop-cock is not a sufficient protection against the further use of the water, he may cause the ferrule to be drawn.

SEC. 27. Upon a re-application for water, where the water has been turned off, and the ferrule has been drawn, an additional charge of three dollars for re-inserting it will be made.

SEC. 28. The Superintendent and proper officers of the Board of Trustees shall have free access, at all reasonable hours, to all parts of the premises, to which water is supplied, to make necessary examinations.

SEC. 29. The Trustees reserve the right to apply a meter to any service pipe, where they may deem it advisable.

SEC. 30. A violation of the preceding rules will cause a stoppage of the supply of water, without previous notice; and it will not be restored except upon the payment of all cost, expenses and damages, and upon a satisfactory understanding with the party, that no further cause of complaint shall arise.

SEC. 31. In all cases, where any servant, apprentice, minor or employe shall be guilty of any breach of the preceding rules and regulations, the master, mistress, employer, parent, or guardian of such guilty person, shall be responsible for, and subject to, prosecution for such violation.

SEC. 32. Any consumer who shall habitually permit others, not members of his family, to use water, from his or their pipe, and any one who shall thus obtain water, shall be fined in a sum not less than five and not exceeding twenty dollars.

SEC. 33. No water is to be taken or used from hydrants at curbstone, except for sprinkling purposes and washing front of house or houses, and any one violating the requirements of this section, shall be fined in a sum not less than five and not exceeding ten dollars, for each offence.

SEC. 34. If proprietors of lumber yards, manufactories, halls, stores, hotels or public buildings, regular customers of water from the works, wish to lay large pipes with hydrant and hose couplings to be used only in case of fire, they will be permitted to connect with the street mains (upon application to the Trustees, and under their direction) at their own expense; and will be allowed the use of water for fire purposes only, free of charge.

SEC. 35. Any Plumber or Pipe Fitter wishing to do business in connection with the Water Works, shall, before receiving a license to do so, file in the office of the Water Works his petition in writing, giving the name of the firm and of each member thereof, and place of business, asking to become a licensed Plumber or Pipe Fitter in connection with said Water Works, stating his willingness and consent to be governed in all respects by the By-Laws and Regulations of said Water Works; and every Plumber or Pipe Fitter shall be subject and conform to, all and singular, the By-Laws and

Regulations and penalties which now exist or may hereafter be passed by said Board of Trustees. Said petition must be signed by two responsible citizens, vouching for the business capacity and reputation of the applicant, and for his worthiness to receive license. Before receiving a license, the applicant shall execute and deposit in the office of the Trustees of the Water Works, a bond with two or more sureties, to be approved by the Board of Trustees, in the sum of one thousand dollars, conditioned that he will indemnify and save harmless the city of Columbus, or Board of Trustees of from all accidents and damages caused by any negligence in protecting his work, or by any unfaithful or inadequate work done by virtue of his license; and that he will also replace and restore the pavement over any opening he may have made to lay service pipe, or for other purposes, to as good state and condition as he found it, and keep and maintain the same in good order to the satisfaction of the Trustees of the Water Works, or their officers, for the period of one month next thereafter; and that he will pay all fines imposed on him for a violation of any By-Laws or Regulations, established by the Board of Trustees of the Water Works. Licenses will be issued by the Secretary upon the order of the Trustees.

SEC. 36. Any Plumber or Pipe Fitter who shall be guilty of a violation of any of the By-Laws and Regulations adopted by the Board of Trustees, shall forfeit his license, and may be subject to a fine, upon conviction, of not less than ten nor more than one hundred dollars. A forfeiture of the license of any Plumber shall operate as a suspension of the license held by any co-partner in the same business, or any person in his employ.

SEC. 37. All lead pipes used for plumbing houses shall

be of the kind known as "strong," and no pipes of lighter weights than those shown in table "A" will be permitted in any case for service pipes ; and all iron pipes used for house service must be submitted to, and withstand, a hydraulic pressure of 150 pounds per square inch.

SEC. 38. Within forty-eight hours after completing any attachment or connection, the Plumber or Pipe Fitter shall make a true return in writing on the back of the permit, of the number of rooms in the premises, or other contemplated use of the water therein, according to the rules and regulations and the tariff of water rates, and file the same in the office of the Secretary, as the water will not be turned on to any premises until complete returns are made by the Plumber or Pipe Fitter.

SEC. 39. The water will not be turned into any house, or private service pipes, except by the Superintendent, upon receiving written notice from the Secretary that the applicant has paid his rent for the current term ; and Plumbers or Pipe Fitters are strictly prohibited from turning the water into any service pipes except upon the order or permission of the Superintendent. This rule shall not be construed to prevent the Superintendent from allowing Plumbers or Pipe Fitters to test their work by letting water into the pipes. But they will be allowed to do it for this purpose only, upon receiving permission from the Superintendent. A violation of this rule will subject the Plumber or Pipe Fitter to the forfeiture of his license.

SEC. 40. No hydrant, except public drinking fountains, shall be placed within the limits of any street, except such hydrant is securely closed and protected against general use ; and no drinking fountain shall be erected for public use, which has openings by which it can be used as a source of domestic supply.

SEC. 41. Water supplied to any place of which the rates and system of measurement is not provided for by any other rules, shall be estimated by the Superintendent, and assessed at the rate of 20 cents per thousand gallons. But whenever practicable, a metre shall be used to obtain a basis for estimation.

SEC. 42. Any customer taking water exceeding 25,000 gallons per day, for one year or more, may obtain special rates by applying to the Trustees, stating the amount of water required, the use to which it is put, and the probable duration of the service, and the Trustees may assess such rate as in their judgement will be proper.

SEC. 43. Ferrules will be inserted in the street main, and service pipe laid to the curb stone, and a stop-cock attached and valve box place at the line of curbstone, by a properly authorized agent of the Trustees, under the direction of the Engineer or Superintendent, at the expense of the Water Works, whenever permits have been issued and paid for, in accordance with section 11 of these rules.

SEC. 44. The size of ferrules will be—

$\frac{3}{8}$ inch for all houses of 9 rooms or less.

$\frac{1}{2}$ " " 9 " to 18.

$\frac{5}{8}$ " " above 18 rooms.

And hotels, boarding houses, and all places requiring a larger supply, the size of ferrule will be determined by the table of discharges annexed, marked "A." Street service pipes will be $\frac{1}{8}$ larger then the ferrule, and the allowed weight of pipes used in plumbing houses will be found in the before-mentioned table "A."

SEC. 45. All bills must be promptly paid when due; and all officers of the water works, are positively prohibited from allowing credit to any one.

Adopted by the Board of Trustees of the Water Works February 1, 1871.

J. R. ARMSTRONG, *Secretary*.

TABLE A.

Showing the discharge of water in gallons per minute from different sized orifices, under the domestic pressure of the Columbus Water Works, and the size of street service pipes used, and the weight per foot of lead pipe allowed in plumbing houses:

Size of Ferrule.	Discharge in gallons per minute.	Size of pipe.	Weight of street service pipes per foot—extra strong.	Weight of house service pipes per foot—strong.
$\frac{3}{8}$ inch	18	$\frac{1}{2}$ inch	2 lbs. 7 oz.	1 lb. 6 oz.
$\frac{1}{2}$ "	33	$\frac{3}{8}$ "	3 "	2 lbs.
$\frac{5}{8}$ "	51	$\frac{3}{4}$ "	3 " 10 "	2 " 8 "
$\frac{3}{4}$ "	73	1 "	4 " 12 "	3 "
1 "	134	$1\frac{1}{4}$ "	6 "	4 "
$1\frac{1}{4}$ "	218	$1\frac{1}{2}$ "	7 " 2 "	4 " 8 "
$1\frac{1}{2}$ "	306	$1\frac{3}{4}$ "	8 " 4 "	5 "
$1\frac{3}{4}$ "	404	2 "	9 " 8 "	6 "

Street service-pipe will generally be one-eighth inch larger than the accompanying ferrules.

Pipes of two inches and over will be made of iron.

By order of the Trustees.

J. L. PILLSBURY, *Chief Engineer*.

